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To: .Cliff Lilly

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From: .Bob Ferguson



Subject: .Update on Plans for the Reduced Sidestream Program

I. Program Objectives

The objective of the program encompasses both research and development activities which will lead to products with reduced sidestream smoke. An important aspect of the program is an emphasis on developing sidestream reduction methods which are proprietary to Philip Morris. The formal statement of the objectives and target dates remain as stated below:

- Conduct research leading to reductions in three sidestream parameters visibility, irritation, and odor. Develop technologies to reduce each of these by 1990.
- Develop cigarette models with 50% reduction of sidestream and evaluate these by 1990.
- Integrate these technologies into ongoing Development programs to produce improved products by end of 1991.

II. Background and Status

The first half of 1988 has seen an increased shift of activities toward research into methods for analysis of a sidestream components and development of in-house capabilities for wrapper modification. Considerable attention was also devoted to interactions with Kimberly Clark (high surface area CaCO_3 papers) and Ecusta (MgOH_2 wrappers with improved subjectives). Progress in this area was driven by the need to provide a reduced sidestream wrapper for the "Trim" cigarette. This intensive R&D effort has produced significant subjective gains over early models and provides a basis for additional refinements even if product targets should be altered.

Research activities have encompassed both method development and model preparation and evaluation.

Visibility

A visibility system was designed and built around a 5-port smoking machine to provide an alternative to either the single or 17-port systems. An 8-port smoking machine was also acquired for future studies.

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A CORESTA study of SS TPM was incorporated into this program as a reference method.

Subjective evaluations of visibility of reduced sidestream cigarettes by panelists were conducted with encouraging results.

Irritants

Ammonia analysis method was completed and model cigarettes were evaluated.

Two methods were developed for aldehydes and a study of glycerine as a precursor of acrolein was completed.

A gc method for benzene and toluene in SS was developed.

GC/MS profile studies continued on gas phase, particulate matter and a headspace sampler was added to the system capabilities.

A possible contract facility for bioassay of irritants was identified.

Odor

A sidestream odor panel was established using E2 conference room and began evaluating samples on a daily basis.

Cigarette butt odor studies progressed to larger scale efforts.

Sidestream Chamber

Design and specifications were completed for a smoke chamber and associated equipment. These were incorporated into a capital appropriation request which has been approved by R&D management.

Models

Strategy sessions were held to develop tactics for smoke reduction methods which resulted in an emphasis on certain paper and construction parameters.

Mr. Bob Rogers, along with Dr. Bokelman's group, have begun to establish a wrapper preparation capability for R&D. A hand sheet lab is under construction. The U. of Maine was selected for contract pilot scale paper preparation.

Efforts were initiated to take advantage of core-periphery differences and blend component differences for sidestream formation.

III. Plans

Emphasis for the remainder of 1988 has shifted to the development and evaluation of models. Based on discussions with suppliers and studies at R&D, several promising strategies have emerged for visibility reduction. Some involve wrappers, others are based on aspects of

construction. The listed tactics below each strategy will be initiated in the 3rd and 4th Q 1988 but few, if any, will be completed this year.

Strategies - Reduced Sidestream

- A. Reduced porosity of wrapper - there are several different modes to accomplish this objective. The goal is to evaluate the relative importance of this parameter. Furthermore, the intent is to determine the relative contribution of various methods by which paper porosity can be reduced.

Studies in this area will include:

Effects of film forming agents, including thermoplastic materials.
Refining effects on fibers.
Lumen loading of fibers with inorganics.
Effect of different fillers used to achieve the same permeability.

- B. Physical-chemical nature of paper fillers

This study will be in cooperation with the Technology Assessment group and Dr. Kallianos. Studies will include:

Evaluation of alternative inorganics, including minerals, to provide a chemically different condensation surface.
Evaluation of new technology to provide a high surface ceramic after heating.
Evaluation of possible importance of mechanisms such as dehydration, altered crystal morphology and large increases in surface area of the inorganic component of the wrapper.

- C. Improved paper technology

One example in this area is the use of dual headboxes to prepare inner and outer papers. The inner paper can contain materials such as carbon to produce unique composite structures.

- D. Aspects of Cigarette Construction

Reduced tobacco in rod - Reduced circumference, reduced rod density

Altered blend composition - Evaluation of blend components core versus periphery effects

Altered burn characteristics - Evaluate effect of added burn agents

Strategy - Mechanism Studies

Additional evaluation of possible mechanisms for sidestream reduction will provide the benefit of setting clearer priorities for future product development. For this reason some studies are planned in this area.

KC and Ecusta will be requested to supply us with papers which can be used for these studies. ^{14}C -labelled tobacco studies are also being planned to provide insight into this area. These will not require additional KC or Ecusta support.

Strategies - Visibility, Irritation and Odor

Improved understanding of these aspects of sidestream smoke will remain important program strategies.

A. Visibility

The 5-port machine will be made fully operational and put into routine use.

Development of alternative modes for visibility studies will continue. These include image analysis methods and light reflectance measurement.

Reduced circumference, permeability effects and other model systems will continue to be evaluated using the visibility measurement systems.

The subjective evaluation of smoke visibility by panelists will be enlarged to provide a basis for future product evaluation and establish a basis for claimed visibility reductions.

B. Irritation

The gc/ms studies will continue. New collection techniques will be evaluated. Additional capabilities for data storage and retrieval will be implemented.

Ammonia in Cigarette Smoke

Measure the SS and MS ammonia deliveries of 100% blend component cigarettes

Analytical support to the SS chamber

Aldehydes in Cigarette Smoke

Measure the MS and SS aldehyde deliveries of 100% blend component cigarettes

Study the contribution of glycerine to the MS and SS aldehydes

Provide analytical support to Trim, and the SS chamber

Benzene and Toluene in Cigarette Smoke

Complete this work on the $\text{Mg}(\text{OH})_2$ cigarettes

Use the method developed for benzene and toluene to study other MS and SS components

Study the effect of heating on the collection efficiency of Cambridge Filters

Provide Analytical support to Trim and the SS chamber

Contract negotiations for bioassay development for irritants will be completed.

C. Odor

The panel will provide a recommendation for any future product development using materials it has evaluated by the end of 1988.

Efforts will continue to identify the compounds responsible for butt aroma. Analytical studies will depend on progress with subjective identification.

Strategy - Sidestream Chamber

Upon appropriate authorization, the remainder of this year will be required for chamber construction.

IV. Resource Allocation

The challenge for this program for the remainder of 1988 will be to develop and demonstrate models for reduced visibility. Subjective considerations are not critical until this minimum requirement has been met. For this reason, increased emphasis will be placed on certain areas:

- Hand sheet and pilot paper facility
- Alternative filler candidates
- New technology for paper additives
- Novel wrapper techniques
- Define relative contribution of blend & construction to reduced visibility
- Develop a better understanding of the mechanisms controlling the contribution of the wrapper to reduced visibility

The attached table highlights some areas where R&D groups are directly influencing the progress of the program. In addition to those listed below, most other R&D functions are supporting this effort to some extent. The total manpower commitment estimate at the 2nd quarter planning conference was 31.0 man years (professional and technicians) for sidestream control.

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STRATEGY AREAS

	MODELS FOR REDUCED SS	MECHANISM STUDIES	VISIBILITY	IRRITATION	ODOR	SIDESTREAM CHAMBER
CHEMICAL RESEARCH	3.1	1.5	2.5	2.0	2.0	1.5
ANALYTICAL RESEARCH		0.5		3.0	.5	
CIGARETTE TECHNOLOGY	1.5		1.0			
PRODUCT EVALUATION			1.0		1.0	
TOBACCO MATERIALS	1.0					
TECHNOLOGY ASSESSMENT	0.5					

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